IN THE WRITTEN DESCRIPTION

Please rewrite the paragraph found at Page 2, line 31 to Page 3, line 4 as follows:

In addition, the monitor system of the present invention may have a calibration fixture having a plurality of contrasting areas, wherein the three-dimensional positions of the calibration fixture contrasting areas are known relative to each other. In another embodiment, the monitor system of the present invention may have a calibration attachment that can be disposed on the face of the striking instrument. The calibration attachment may have a plurality of contrasting areas disposed on its surface. Preferably, the three-dimensional positions of the calibration ~~fixture~~ attachment contrasting areas are known relative to each other.

Please rewrite the paragraph found at Page 4, lines 9-20 as follows:

Some embodiments of the present invention concern methods for calibrating a striking instrument with a one-camera monitoring system. For example, one method of the present invention involves the steps of providing a single camera unit having a light sensitive panel that is capable of being focused on a first field of view, placing a striking instrument having a first plurality of contrasting areas within the first field of view of the single camera unit to provide a first perspective view of the striking instrument and first plurality of contrasting ~~images~~ areas, capturing a first image of the first perspective view of the striking instrument and first plurality of contrasting areas, providing a second perspective view of the striking instrument and first plurality of contrasting areas, capturing a second image of the second perspective view of the striking instrument and first plurality of contrasting areas, and analyzing the first plurality of contrasting areas in the first and second images of the striking instrument to determine their three-dimensional positions.

Please rewrite the paragraph found at Page 5, lines 6-9 as follows:

In some embodiments, the steps of obtaining images of one, two or more perspective views of various components of the present invention may be combined. For instance, the steps of capturing perspective views of the striking instrument and of the calibration fixture may be performed at the same time.

Please rewrite the paragraph found at Page 5, lines 10-19 as follows:

As mentioned above, a calibration attachment may also be used in the present invention. In one embodiment, the calibration attachment may have a plurality of contrasting areas with their three-dimensional positions ~~on the calibration fixture~~ being known relative to each other. In use, the calibration fixture may be placed on the striking instrument, such as on the face of a golf club. The positioning of the calibration attachment may be selected [[to]] so that the first and second captured images of the first and second perspective views of the striking instrument and first plurality of contrasting areas further also comprise images of the contrasting areas of the calibration attachment when disposed on the striking instrument. Once the images are captured, the calibration ~~fixture~~ attachment may then be removed.

Please rewrite the paragraph found at Page 7, lines 8-21 as follows:

Turning in particular to FIG. 1(a), club path **P** is from outside-to-inside at impact producing a negative **A** angle and the face is closed producing a negative angle **B**. The result is a pull hook shot.

FIG. 1(b) shows the clubhead path **P** along line $\mathbf{L}_i$ and the clubhead closed with a negative angle **B** which conditions produce a hook;

FIG. 1(c) shows the clubhead path **P** such that angle **A** is positive while a closed face creates a negative angle **B** for a push hook shot;

FIG. 1(d) shows the **P** and **F** coinciding at an angle to $\mathbf{L}_i$ producing a pull shot;

FIG. 1(e) shows a straight flight shot;

FIG. 1(f) shows conditions that produce a push;

FIG. 1(g) whose conditions that result in a pull slice shot;

FIG. 1(h) shows the clubhead path **P** along the ~~line 1~~ **line** $\mathbf{L}_i$, but with the club face open to produce a slice; and

FIG. 1(i) shows the condition for a push slice.

Please rewrite the paragraph found at Page 7, lines 22-23 as follows:

FIGS. 2a-c shows a clubhead having a level attack angle **EL**; descending attack angle **D**; and rising attack angle [[U]] **V** producing ball flights of **BF**.

Please rewrite the paragraph found at Page 10, lines 1-9 as follows:

This more accurate and less time consuming method pivots the club and club fixture placed in a calibration fixture shown in [[FIG]] <u>FIG.</u> 9 in order to calibrate the club. By pivoting the fixture about point A by about 5 to about 10 degrees, or by moving the camera to change the angle by a similar amount, the resulting two images on the camera sensor can be triangulated to determine the markers on the club in a body coordinate system. In this manner, a single camera system may be calibrated to significantly increase its accuracy so that it approximates or approaches the accuracy of a multiple camera systems without the added cost, system weight, and complexity often associated with multiple camera systems.

Please rewrite the paragraph found at Page 10, lines 10-20 as follows:

In this triangulation method, calibration of clubhead unit **7** is accomplished by disposing attachment **32** to club face **7f**. In one embodiment, the attachment **32** may be associated with or disposed on the club face by magnetic forces, use of a putty or other adhesive, or by any other suitable manner. Vertical orientation line **32v** and horizontal line **32h** may be used to orient and locate attachment **32** on clubhead face **7f** having club face grooves **10d** etc. Other markers or indicators also may be used to help visually align or orient the attachment properly on the club face. For example, line **32h** may be parallel to face grooves **10d**. Attachment **32** may include three (3) retroreflective markers or dots **31a-c**; clubhead <u>unit 7</u> also may have ~~**7h** has~~ retroreflective markers **30u**, **30v**, **30w**, and **30y**. It should be understood, however, that fluorescent markers also may also be used. Preferably, each marker is about 1/4" in diameter.

Please rewrite the paragraph found at Page 10, line 31 to Page 11, line 2 as follows:

From solving the unique rotational and translational relationship between the four markers or dots **30u, 30v, 30w, 30y** on the club head unit **7** and the three (3) markers or dots **31a**, **31b**, **31c**, the intended point of impact on the club (the sweet spot) can uniquely be found at any location of the swing in the field through reflective light from the dots **30u,v,w,y** on the club unit **7**. The attachment **32** may then removed from [[clubs]] <u>club</u> face **7a** after calibration is completed.

Please rewrite the paragraph found at Page 12, line 27 to Page 13, line 7 as follows:

Preferably, both of these scenes or images also capture or include the U,V image coordinates of each of the seven markers on the club with attachment. These image coordinates of the markers can then be mapped to three dimensional space measurements once the D_{i1} and D_{i2} (i=1,11) coefficients are determined. To do this transformation we solve the four equations in three unknowns describing each point shown in Equations 1 and 2 with the unknowns now being club marker points X(i), Y(i), and Z(i); where i = 1-7. These four equations are linear in X(i), Y(i), and Z(i) and therefore can be solved by the least squares method. With the club points now triangulated, the four points on the body of the club will uniquely be related to the three attachment markers. By tracking the four markers on the body of the club during the swing, the center of the face and its orientation is uniquely connected to these measured markers on the attachment.

Please rewrite the paragraph found at Page 13, lines 10-22 as follows:

In referencing the velocity of the clubhead to a direction downrange and a direction parallel to gravity, a third coordinate system can be created. In particular, this global coordinate system provides the resulting speed, spin rate, and path direction of the club at its hit location. The third coordinate system may be created by imaging a ~~mult-marker~~ multi-marker calibration fixture **30** as illustrated in FIG. 6. The calibration may have 6 or more markers capable of defining at least 2 planes. As the number of markers placed on a calibration fixtures is increased, the accuracy of the calibration also may increase. Preferably the calibration fixture comprises 10 or more markers capable of defining 2 or more planes, and more preferably the calibration fixture comprises 15 or more markers defining 2 or more planes. In one embodiment, shown in FIG. 6, the markers are capable of defining 3 or more planes. By knowing the location of each marker, an image of the calibration fixture may be used to solve the equations below (Equations 3 and 4) for the $M_{global\text{-}camera}$ matrix.

Please rewrite the paragraph found at Page 14, lines 13-16 as follows:

As a golfer swings clubhead unit 7 through field **35**, the system electronic images are seen through camera **18** as shown on panel [[**18a**]] **18p** in FIG. 8. As seen from one camera, the model photogrammetric equations to be solved given the camera coordinates *U*, *V* for the four club markers are as follows (Equations 5 and 6):

Please rewrite the paragraph found at Page 15, lines 19-25 as follows:

With calibration completed, the one-camera system of the present invention may be used to accurately monitor a golfer's swing. The camera of the present invention may be aimed or directed toward an area or field of view where a golfer will be swinging a club. A ball **8** [[maybe]] may be teed or otherwise placed in the field of view of the camera. For example a ball **8** may teed up about 25 inches from camera **18**. The club head **7** may then be placed behind ball **8** at address and club head unit **7** (on a shaft not shown) may be swung through the three-dimensional field of view **35** (FIG. 5).

Please rewrite the paragraph found at Page 16, lines 21-33 as follows:

In monitoring club motion, the operator reads in the graylevel threshold for the image and total exposure time of the scene. A photosensor (*e.g.*, Tritronics sensor) senses the retroreflector marker on the club entering the camera viewing [[the]] area and triggers the camera to expose. The captured image of the markers on the club at two or more strobed positions may be displayed on the video monitor for acceptance by the operator. The second strobe is set to fire at about 200 microseconds prior to the exposure time. This results in crisp images that are not overexposed from sunlight. A blob analysis subprogram finds the centroidal location of the 8 reflected club marker images and the six ball marker images and their shape. The six markers on the ball at the far end of the image is found and segmented from the club markers. These six ball markers allow the calculation of the position of the center of mass of the ball before impact which will then give an estimate of the hit location on the golf club face. Equations similar to 5 and 6 are employed to find the center of mass location.

Please rewrite the paragraph found at Page 17, lines 1-11 as follows:

With the adjustment to the input image scene completed, the translation of the club center (T_x, T_y, $T_{z)}$ and three euler angles can be calculated from Equations 5 and 6 at the at least two positions captured in space. The coordinates of the ~~fixture~~ calibration attachment placed on the face at the time of the calibration can be calculated at the two ~~position~~ positions of the club to estimate the speed and orientation of the clubface prior to impact. The variables that can be measured are defined as follows:

1. Club Velocity (inches/second)

2. ~~Attack Angle (arctan(V_y/[(V_x^2 + V_y^2)$^{1/2}$]))~~ Attack Angle (arctan(V_y/[(V_x^2 + V_z^2)$^{1/2}$]))

3. Path Angle (arctan(V_x/V_z)), where a positive value indicates the path of the swing was from right to left, and a negative value indicates the path of the swing was from left to right.